

# 5.4 Rectilinear motion (motion in a straight line)

5.4/all of them

Ideas

You know  $D = RT$ .  
(distance = rate \* time)

change in position

change in time

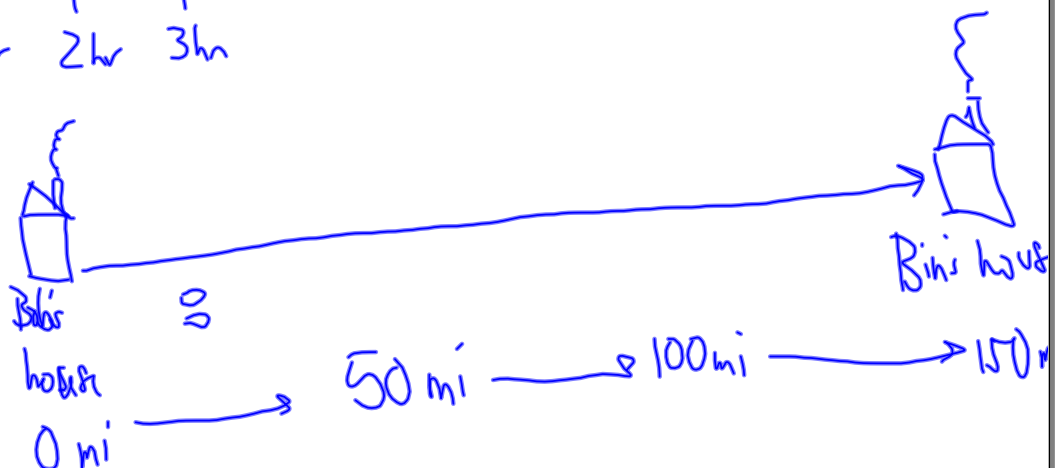
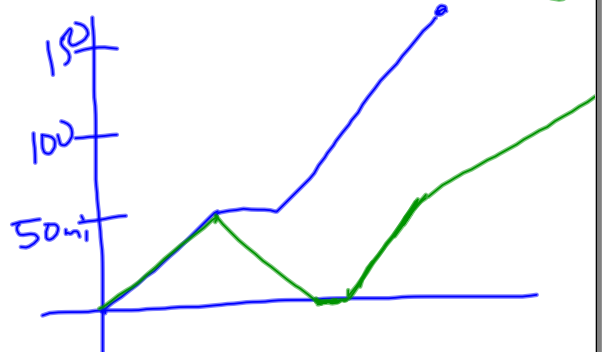
$$R = \frac{D}{T}$$

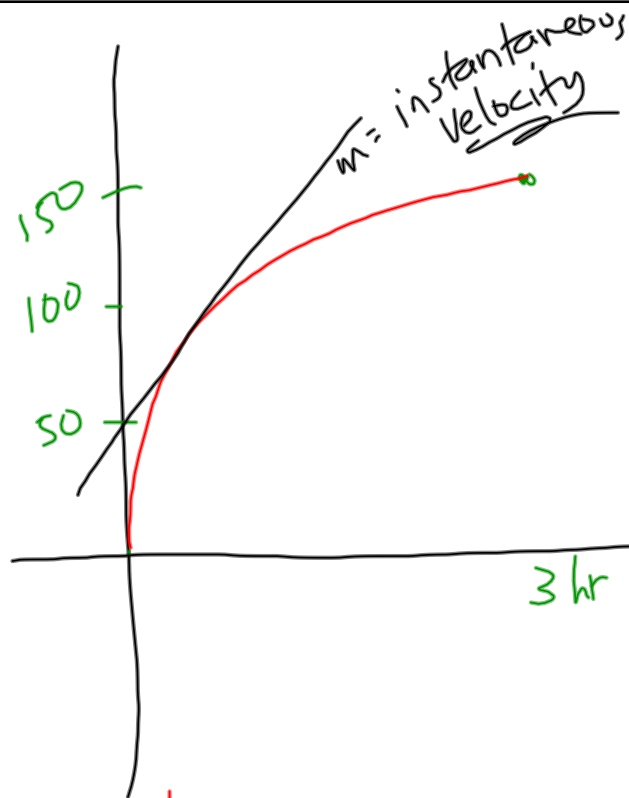
Our "upgraded" idea: we refer to position  
(relative to a reference point)

average rate of change



$$m = \frac{50 \text{ mi}}{1 \text{ hr}}$$





position function

$$s(t) =$$

$$x(t) =$$

$$y(t) =$$

distance - from a reference point - in 1 of 2 directions

velocity - speed in a particular direction

$$v(t) =$$

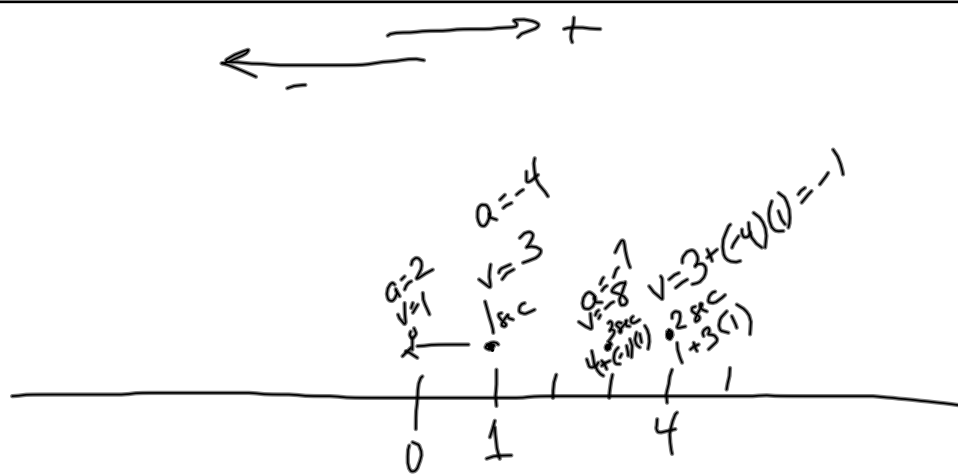
$$\text{"speed"} = |v(t)|$$

acceleration - chg in velocity (has a direction)

$$a(t) =$$

Speeding up  
positive velocity  
AND  
positive acceleration

OR  
negative velocity  
AND  
negative acceleration



position = 0

velocity = 1 unit/sec

$$\text{position}(1 \text{ sec}) = \text{position}(0) + \text{velocity}(0) \times \text{time}$$

$$0 + 1 \times 1$$

acceleration = 2 unit/sec

$$\text{new velocity}(1 \text{ sec}) = \text{velocity}(0) + \text{acceleration}(0) \times \text{time}$$

$$1 + 2(1) =$$

ML 3) Albert, Betty, Catherine work together & complete a job in  $h$  hours. A alone can do the job in an additional 6 hours ( $6+h$ ). B alone can do it in an additional 1 hr ( $h+1$ ). C alone takes twice as much time ( $2h$ ). What is  $h$ ?

4) If  $x-y = -6$  and  $x^2 - y^2 = 72$ .  
What is  $x^2 + 2xy + y^2$ ?

6) The number of diagonals in a regular polygon is 27.  
What is the size of an interior angle?

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Think in terms of 1 job

A does  $\frac{1}{6+h}$  jobs per hour

B does  $\frac{1}{h+1}$  jobs per hour

C does  $\frac{1}{2h}$  jobs per hour


so they work together and do  $h\left(\frac{1}{h+6} + \frac{1}{h+1} + \frac{1}{2h}\right) = 1$  job  
solve for  $h$ .

4) If  $x-y = -6$  and  $x^2-y^2 = 72$ .  
What is  $x^2+2xy+y^2$ ?


$$\frac{x^2-y^2}{x-y} = x+y = 12$$

$$x^2+2xy+y^2 = (x+y)^2 = 12^2 = 144$$

6) The number of diagonals in a regular polygon is 27.  
What is the size of an interior angle?

 = 0 diag

 = 2 diag

 = 5 diag -  $\frac{5(5-3)}{2} = 5$

$$\frac{6(6-3)}{2} = 3(3) = 9$$

$$\frac{7(7-3)}{2} = \frac{7 \cdot 4}{2} = 14$$

$$\frac{8(8-3)}{2} = 4(5) = 20$$

$$\frac{9(9-3)}{2} = \frac{9 \cdot 6}{2} = 27$$

$$\begin{aligned} 9-2 &= 7 \text{ triangles} \\ \frac{7 \cdot 180}{9} &= 140^\circ \end{aligned}$$